SC040200 Unit Outline

Interactions, Interrelationships, and Interdependence within the Natural World

Unit 2: Energy – Its Forms and Interactions

Abstract

This physical science unit introduces students to energy, its different forms, and its interactions with matter. They explore the properties of the various forms of energy through realistic problems. Students learn about electricity, as an energy form, through the investigation of simple electrical circuits. They also construct a game using simple electrical circuits. Students observe, experiment, and discover that energy can change forms. They identify common forms of energy in their school, analyze how each form is used, and suggest ways in which each form can be conserved.

Lesson 1 – Energy All Around (SC040201)
Students explore different forms of energy: sound, light, heat, energy of motion, and wind. Through their explorations, students begin to discover and identify how these forms of energy are alike and how they are different.

Lesson 2—Form to Form (SC040202)
In this lesson, groups of students adopt one of the Form of Energy stations from Lesson 1 and explore that form of energy in depth. Students also demonstrate how one form of energy can be transformed to another form of energy.

Lesson 3—Electrical Energy (SC040203)
In this lesson students work in small groups to light a bulb using a battery and a wire. Through their exploration, students construct a simple pathway (a circuit) for electricity. Later in the lesson, a small motor is introduced to reinforce the idea that electricity as a form of energy can be used to do useful work.

Lesson 4—Take the Circuit Challenge! (SC040204)
In this lesson student teams construct a closed circuit using a variety of components (batteries, bulbs, motors, buzzers, and wire). Each team of students "challenges" another team to build their circuit, using only the components provided.

Lesson 5 — Sun-Sational! (SC040205)
Students investigate whether or not there are differences in heating and cooling among three different earth materials (dark soil, light sand, and water) when these are exposed to and removed from sunlight. Students learn that the sun's energy is transformed to heat energy here on Earth.

Lesson 6—Happenin' Heat (SC040206)
In this lesson students explore how heat energy is transferred through convection. They place plastic bags of warm and cool water on top of each other and measuring the change in temperature. Next, students measure changes in the temperature of air inside foam cups, each of which has a small container of hot water placed in it. They also measure changes in the temperature of the water in the foam cups. Students graph their results and draw conclusions about heat transfer.

Lesson 7 — Heat Energy and Insulation (SC040207)
Students explore different insulation materials and their effectiveness in reducing the loss of heat energy to the air. This lesson lays the foundation for understanding energy conservation.

Lesson 8—Ask about Energy (SC040208)
In this lesson students list the types of energy used in school. They find out about forms and sources of energy by talking to the maintenance staff and a speaker from the local utility company. Students develop a survey of energy use to use with staff and other students at the school. They collect data about energy use at school through interviews, and then analyze and discuss the results.

Lesson 9— Energy Observations (SC040209)
In this lesson students undertake an energy audit of their school. They begin this process by looking carefully at their classroom. Students are then assigned certain parts of the school building. There, they observe and record air temperatures, details about where heat may be transferred to the outdoors, and information about school lighting. These data form a foundation for students' subsequent recommendations about conserving energy.

Lesson 10— We Have A Plan! (SC040210)
In this lesson students learn about energy conservation measures. They use data gathered in Lessons 8 and 9 to discover ways to conserve energy in their school. As a final project, students develop and present recommendations for conserving energy in the school.

Michigan Benchmarks

Develop strategies and skills for information gathering and problem-solving (I.1.E.5).
Tools: Sources of information, such as reference books, trade books, magazines, web sites, other people's knowledge.

Real-World Contexts: Seeking help from or interviewing peers, adults, experts, using libraries, World Wide Web, CD-ROMs, and other computer software, other resources.

Describe ways in which technology is used in everyday life (II.1.E.3).
Key Concepts: Provide faster and farther transportation and communication, organize information and solve problems, save time.

Real-World Contexts: Cars, other machines, radios, telephones, computer games, calculators, appliances, email, the Worldwide Web.

Identify forms of energy associated with common phenomena (IV.1.E.3).
Key Concepts: Heat, light, sound, food energy, energy of motion, electricity.

Real-World Contexts: Appropriate selection of energy and phenomena, such as appliances like a toaster or iron that use electricity, sun's heat to melt chocolate, water wheels, wind-up toys, warmth of sun on skin, windmills, music from guitar, simple electrical circuits with batteries, bulbs and bells.

Construct simple, useful electrical circuits (IV.1.E.4).
Key Concepts and Tools: Complete loop; batteries, bulbs, bells, motors, wires, electrical switches.

Real-World Contexts: Flashlights, battery-powered toys.

National Science Education Standards

Through the activities in this unit students and teachers can achieve the following National Science Education Standards:

Physical Science CONTENT STANDARD B: As a result of activities in grades K-4, all students should develop understanding of

- Properties of objects and materials
- Position and motion of objects
- Light, heat, electricity and magnetism